Intellectual, Narcissistic, or Machiavellian? How Twitter Users Differ from Facebook-Only Users, Why they Use Twitter, and What They Tweet About

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Author note: The preregistration for Study 2 can be found here: https://osf.io/6q2zr

Abstract

Twitter is one of the world's most popular social networking sites, yet gaps remain in our knowledge about the psychology of its users. The current studies sought to fill these gaps by examining whether the Big Five and Dark Triad personality traits predicted differences between Twitter users and Facebook-only users, motives for using Twitter, the frequency of tweeting about four topics – intellectual pursuits, personal achievements, diet/exercise, and social activities – and how much they liked to read tweets about these topics. Study 1 found that Twitter users (N = 346) were higher in openness (i.e., intellect, creativity) than were Facebook-only users (N = 268). In Study 2, a preregistered replication, Twitter users (N = 255) were not only higher in openness than Facebook-only users (N = 248), but they were also more Machiavellian. In both studies, Twitter users who were higher in openness were more strongly motivated to use Twitter for career promotion, and in turn, they tweeted more frequently and most liked to read tweets about intellectual pursuits. Narcissists were more strongly motivated to use Twitter for career promotion, social connection, and attention-seeking, and in turn, they tweeted more frequently and most liked to read tweets about personal achievements and diet/exercise. On average, participants most liked to read tweets about intellectual pursuits and least liked tweets about diet/exercise. We discuss the implications of these findings for tailoring one's tweets to retain followers and for drawing the boundary conditions when extrapolating from Twitter-based "big data" to larger populations.

Keywords: Twitter, Facebook, social media, Big Five personality traits, Dark Triad

Public Policy Relevance Statements: Twitter users significantly differed in their personality traits from Facebook-only users, suggesting that social scientists take caution when generalizing from Twitter-based "big data" to larger populations. Our finding that Twitter particularly attracts open-minded individuals who wish to advance their careers through

tweeting about intellectual topics has relevance not only for individuals wishing to maximize their use of social media, but also for Twitter's marketing and retention strategies.

Intellectual, Narcissistic, or Machiavellian? How Twitter Users Differ from Facebook-Only Users, Why they Use Twitter, and What They Tweet About

If an individual would rather discuss science, politics, and current events than social activities or diet and exercise routines, would they be more likely to use Twitter or Facebook? Twitter has over 330 million active users (Statistica, 2018), yet only a handful of studies have examined the personality traits and motives that drive Twitter use (e.g., Davenport, Bergman, Bergman, & Fearrington, 2014; Hughes, Rowe, Batey, & Lee, 2012; Johnston, Chen, & Hauman, 2013; Panek, Nardis, & Konrath, 2013; Petrocchi, Asnaani, Martinez, Nadkarni, & Hofmann, 2015; Phua, Jin, & Kim, 2017). In contrast, the predictors of Facebook use have been researched extensively (for a review, see Wilson, Gosling, & Graham, 2012; for a meta-analysis, see Marino, Gini, Vieno, & Spada, 2018). Further research on the uses and gratifications of Twitter is important not only because it can suggest ways that people tailor their own usage to maximize enjoyment and function, but also because it provides social scientists with a more accurate picture of who uses Twitter and why – an especially relevant goal given the proliferation of studies that mine "big data" from Twitter and generalize findings to the larger population (Jensen, 2017).

Toward this end, the first purpose of the current research was to examine the Big Five and Dark Triad personality traits as predictors of the likelihood of using Twitter versus Facebook-only. What motivates people to use Twitter when Facebook, with over 2 billion active users (Statistica, 2018), is so ubiquitous? Despite Facebook's dominance, 52% of internet users have memberships at two or more social media sites (Pew Research Centre, 2014), sharing different content to different sites (Lee, Hoang, & Lim, 2017). Because Twitter tends to be more anonymous, public, non-reciprocal, and impersonal than Facebook (Davenport et al., 2014; Huberman, Romero, & Wu, 2009; Johnston, Chen, & Hauman, 2013; Walton & Rice, 2013), it tends to attract users who privilege the sharing of information over

social and personal content (Hughes et al., 2012). To gauge whether a unique constellation of personality traits impels Twitter use,[1] we used the approach taken by Petrocchi, Asnaani, Martinez, Nadkarni, and Hofmann (2015) and compared Twitter users with Facebook-only users. We focused on Facebook-only users as our comparison group because of their sheer numbers – e.g., 68% of American adults use Facebook (Pew Research Centre, 2016) – and basic demographic similarity with Twitter users. We reasoned that social media non-users would be a less relevant comparison group because they tend to differ from Twitter users in their demographic characteristics such as age: most social media non-users are age 65 and older (Pew Research Centre, 2015a).

The second purpose of the present research was to examine the informational and social motives that drive Twitter use. Informational motives for using Twitter include seeking and sharing impersonal news related to current events, science/research, entertainment, and celebrities (Hargittai & Litt, 2011; Hughes et al., 2012; Java, Song, Finin, & Tseng, 2007), and exchanging information that could result in career promotion (Coursaris, Yun, & Sung, 2010; Holton, Baek, Coddington, & Yaschur, 2014). Social motives for using Twitter include the maintenance of strong-tie social connections – e.g., keeping in touch, communicating, and seeing what others are up to (Chen, 2011; Lee & Kim, 2014) – and weak-tie connections with individuals with whom one does not have an offline relationship (Phua et al., 2017). People tend to be more strongly motivated to use Twitter for informational purposes than for strong-tie social connection purposes (Huberman, Romero, & Wu, 2009; Hughes et al., 2012; Johnston, Chen, & Hauman, 2013; Johnson &Yang, 2009; Kwak, Lee, Park, & Moon, 2010; Liu, Cheung, & Lee, 2010). Nonetheless, Twitter users may be driven by another type of

[1] "Twitter users" and "Facebook-only users" are the terms we have adopted for simplicity whilst acknowledging the overlapping social media memberships of the majority of our participants. Most of our Twitter users also used Facebook, reflecting findings that Twitter users typically start as Facebook-only users and gradually adopt Twitter as a complementary social networking site (Wiederhold, 2012). Moreover, many of our participants from both groups also used Instagram and Snapchat; the main distinction is that none of the Facebook-only users also used Twitter.

social motive: the need for validation and attention-seeking. Indeed, the short length of tweets (i.e., updates that use a maximum of 280 characters) and the asynchronous nature of follower/followee relationships suggest that Twitter affords self-centred, superficial, non-reciprocal updates that may attract attention, admiration, and validation from other users (Davenport et al., 2014). We therefore focused our investigation on two informational motives for using Twitter (information-seeking and career promotion) and two social motives (social connection and attention-seeking).

The third purpose of this research was to investigate the personality traits and motives that spur the choice of topics that users tweet about and how much they like to read others' tweets about these topics. No study until now has examined the traits and motives that predict tweet topics, in spite of past research exploring the range of topics that people tend to tweet about (e.g., Andre, Bernstein, & Luther, 2012; Kwak et al., 2010; Java et al., 2007). The topics addressed in tweets may be impersonal, such as sharing links or opinions on news stories, entertainment, science, or other information, or personal – e.g., one's current activities, mood, everyday life, or conversations with other users (Hargittai & Litt, 2011). Based on this previous work and on the scheme used by Marshall, Lefringhausen, and Ferenczi (2015) for classifying Facebook status update topics, the current studies focused on the frequency of tweeting about and liking for an impersonal topic (intellectual pursuits) and three personal topics (social activities and everyday life, personal achievements, and diet/exercise).

It is important to investigate *who* tweets about certain topics and *why* because tweets that are evaluated more favourably may attract retweets, likes, and followers (Suh, Hong, Pirolli, & Chi, 2010), whereas tweets that are evaluated unfavourably – e.g., as boring, uninformative, or banal – may be ignored or even lead one to lose followers (Andre et al., 2012; Kwak, Chun, & Moon, 2011). Accordingly, we assessed whether people who tweeted

more frequently about favourable topics received a greater number of likes and retweets from followers – an important aim given that attention from one's social media network is associated with enhanced well-being (Tobin, Vanman, Verreynne, & Saeri, 2015). Moreover, greater understanding of what drives topic choice and favourability may allow users to tailor the content of their tweets for their followers, enabling better maintenance of their network. In the following sections, we outline the theoretical connections between the Big Five and Dark Triad with motives for using Twitter, the topics that people tweet about, and their evaluations of these topics.

Associations of the Big Five and Dark Triad Personality Traits with Twitter Use

According to the Big Five theory of personality (Costa & McCrae, 1992), individuals differ in their personality traits along five dimensions: openness, conscientiousness, neuroticism, extraversion, and agreeableness. People high in openness are creative, intellectual, and curious; conscientious individuals are disciplined, have a strong work ethic, and prefer order; people who are neurotic tend to be nervous, sensitive to threat, and high in negative affect; extroverts are sociable, sensitive to rewards, and high in positive affect; and agreeable people are friendly, cooperative, and warm. While the Big Five characterize most people across time and situations, the Dark Triad traits – narcissism, Machiavellianism, and psychopathy – more specifically characterize people who tend to be self-serving, duplicitous, callous, and antisocial (O'Boyle, Forsyth, Banks, Story, & White, 2015). Narcissistic individuals are egocentric, grandiose, vain, entitled, and attention-seeking (Raskin & Terry, 1988); Machiavellian individuals are cynical, manipulative, morally pragmatic, emotionally cold, and strategic in their quest to gain status and build their reputation (Jones & Paulhus, 2014; Lang & Abell, 2018); and psychopathy is characterized by impulsivity, thrill-seeking, aggression, recklessness, and lack of remorse (Paulhus & Williams, 2002).

A growing body of research has examined associations of the Big Five and, to a lesser extent, the Dark Triad, with motives for using Twitter (e.g., Hughes et al., 2012) and the content of tweets (e.g., Preotiuc-Pietro, Carpenter, Giorgi, & Ungar, 2017). However, no previous research to our knowledge has examined associations of the Big Five and Dark Triad traits with Twitter motives and frequency/likeability of tweet topics within the same study; moreover, our research is the first to examine whether Twitter users differ in Machiavellianism and psychopathy compared to non-users. Such research is warranted insofar as the public and anonymous nature of Twitter particularly affords the tendency for people high in the Dark Triad traits to engage in online trolling (Buckels, Trapnell, & Paulhus, 2014).

Of the Big Five, the present studies focused on openness and extraversion due to their theoretical associations with informational and social motives for using Twitter, respectively; we examined associations of conscientiousness, agreeableness, and neuroticism with Twitter use on an exploratory basis only. Of the Dark Triad, we focused on narcissism in Study 1 due to its well-established links with Twitter motives and behaviour (e.g., Davenport et al., 2014; Panek, Nardis, & Konrath, 2013), and all three traits in Study 2. The associations of psychopathy with the motives for using Twitter and tweet topics were examined on an exploratory basis only. Further exploratory analyses also tested whether the motives for using Twitter mediated the associations of traits with the frequency of tweeting about the various topics. We describe the predicted associations in more detail below.

Openness. The imagination, creativity, and intellectual curiosity of highly open individuals contributes to their greater use of Facebook for finding and sharing information and posting status updates that address intellectual topics (Marshall et al., 2015; Park et al., 2015). To the extent that Twitter affords even greater sharing of impersonal information than Facebook (Kwak et al., 2010), it is reasonable to surmise that Twitter would be especially

attractive to highly open individuals. Few studies, however, have tested this proposition: in one, Twitter users were marginally higher in openness than were non-users (Jin, 2013); in another, highly open individuals were heavier users of Twitter – they tweeted more often and had more followers (Sumner, Byers, Boochever, & Park, 2012). In Study 1, we hypothesized that openness would be positively associated with the likelihood of using Twitter versus Facebook-only (H1a), with the use of Twitter for information-seeking (H1b), and with the frequency of tweeting about intellectual topics (H1c).

Extraversion. Because Twitter is less likely to afford reciprocal socializing than is Facebook (Huberman et al., 2009), it may be less appealing to extraverts' sociable nature. Indeed, extraverts are less likely to prefer Twitter to Facebook (Hughes et al., 2012), and they are also less motivated to use Twitter to find and share impersonal information (Hughes et al., 2012) – arguably Twitter's main attraction. Yet Twitter does serve a social connection function (Chen, 2011) that may be enticing to extraverts even if its informational function is not. Indeed, Twitter users, relative to non-users, are higher in extraversion (Jin, 2013), and extraverts are more likely to refer to social processes in their tweets (Sumner et al., 2012). Thus, in the face of competing motivations for using Twitter, we remained agnostic as to whether extraverts would be more likely to use Twitter than Facebook-only, but expected that extraverts' weaker information motives (H2a) would mean that they would tweet less frequently about intellectual topics (H2b), whereas their stronger social connection motives (H2c) would mean that they would tweet more frequently about social activities and everyday life (H2d).

Narcissism. Consistent with their attention-seeking behaviour offline (Buss & Chiodo, 1991), narcissists tend to be self-promoting and attention-seeking on Facebook (Ferenczi, Marshall, & Bejanyan, 2017) and on Twitter (Davenport, et al., 2014; Panek et al., 2013). For example, narcissists are more likely to post selfies and edit them to enhance their

appearance to attract attention and admiration from followers on social networking sites such as Twitter (Fox & Rooney, 2015). We predicted in Study 1 that narcissists would be more likely to use Twitter than Facebook-only (H3a), to be more strongly motivated to use Twitter for attention-seeking (H3b) and for career promotion (H3c), and to tweet more frequently about two topics that may be ego-boosting: personal achievements (H3d) and diet and exercise (H3e). Indeed, narcissists' emphasis on their physical appearance (Vazire, Naumann, Rentfrow, & Gosling, 2008) may be expressed through more frequent social media posts about diet and exercise (Marshall et al., 2015).

Machiavellianism. We predicted that people with Machiavellian traits would be more likely to use Twitter than Facebook-only (H4a) for two reasons. First, because Machiavellians tend to be deceitful, manipulative, and concerned with maintaining a socially desirable reputation (Jones & Paulhus, 2014), they may be especially motivated to use Twitter to gather information (H4b) that allows them to cultivate influence over others and enhance their own social capital. Second, the reputational concerns of Machiavellians may mean that they are more likely to use Twitter to manage and enhance their careers (H4c). Indeed, Machiavellians tend to use Twitter to ingratiate themselves with influential others (Preotiuc-Pietro, Carpenter, Giorgi, & Ungar, 2017), such as colleagues within their professional circle. Because of these information-seeking and career-promoting motives, we predicted that Machiavellians would more frequently tweet about intellectual topics (H4d) and personal achievements (H4e). Hypotheses 4a-e were tested in Study 2 only.

Study 1

Participants

The inclusion criteria for this study stipulated that participants needed to be registered users of Twitter and/or Facebook.[2] The original sample consisted of 622 participants, but data from six participants was removed because they indicated that they were not registered users of either Twitter or Facebook, and a further two were removed after examination of IP addresses and demographic information revealed they were duplicates. In the final sample of 614 participants (57% female; M_{age} = 30.60, SD_{age} = 9.03), 335 were registered users of both Facebook and Twitter (55%), 268 were registered users of Facebook but not Twitter (44%), and 11 were registered users of Twitter but not Facebook (2%). Of the 346 registered Twitter users (M_{age} = 30.29, SD_{age} = 8.84), 55% were female, and 67% were currently working towards or had completed at least a Bachelor's degree. 73% were White, 7% Hispanic, 7% African/Caribbean, 2% East Asian, and the rest were of various other ethnicities. They reported that on days that they checked Twitter, they spent an average of 51.43 minutes (SD = 71.85) actively checking it. Of the Facebook-only users (M_{age} = 31.15, SD_{age} = 9.30), 60% were female, and 64% were currently working towards or had completed at least a Bachelor's degree. 80% were White, 5% Hispanic, 5% African/Caribbean, 3% East Asian, and the rest were of various other ethnicities.

92% of participants were recruited through Amazon's Mechanical Turk (MTurk) and paid $1.00, and 8% were recruited through web forums for online psychology studies for no payment. All participants recruited through MTurk were currently living in the United States, as were 72% of those recruited through other web forums (of the remaining, 15% were living in English-speaking Western countries, 6% in Europe, 6% in Southeast Asia, and 2% in

[2] Parts of this data set have been published elsewhere (Marshall, Lefringhausen, & Ferenczi, 2015). Reflecting the aims of the larger project of which the current study was a part, an additional inclusion criteria stated that participants needed to have experienced a romantic breakup with someone whose Facebook and/or Twitter profile they had seen at least once. Considering the ubiquity of Facebook and Twitter, it seems highly likely that the overwhelming majority of users would have looked at a romantic partner's social media profile either when they were together or after their breakup; indeed, one estimate suggests that 88% of Facebook users have looked at an ex-partner's Facebook page after a breakup (Lukas & Quaan-Haase, 2015). Therefore, we do not think this inclusion criteria significantly biased our sample.

Africa). Compared to traditional participant samples (i.e., university students tested in a laboratory setting), MTurk participants not only provide data of equivalent or even superior quality, but they are also more socioeconomically and ethnically diverse (Burhmester, Kwang, & Gosling, 2011; Casler, Bickel, & Hackett, 2013; Hauser & Schwarz, 2016). We therefore felt confident that our findings could generalize to the larger population of Twitter and Facebook users.

Materials and Procedure

Participants completed an online questionnaire in English that consisted of demographic questions and the following scales. Cronbach's alpha coefficients are reported in Table 1. This research was approved by the research ethics committee at the first author's institution.

Big Five Personality Traits. Extraversion, neuroticism, openness, agreeableness, and conscientiousness were measured with the 35-item Berkeley Personality Profile (Harary & Donahue, 1994). Each trait was measured with 7 items (e.g., extraversion – "I am outgoing, sociable"), and participants indicated their responses on a 5-point Likert scale (1 = *Strongly disagree*, 5 = *Strongly agree*).

Narcissism. The 13-item version of the Narcissistic Personality Inventory (NPI-13; Gentile, Miller, Hoffman, Reidy, Zeichner, & Campbell, 2013), derived from the original NPI-40 (Raskin & Terry, 1988), uses a forced-choice rating scale, such that one choice represents greater narcissism and the other less (e.g., "I like to look at myself in the mirror" versus "I am not particularly interested in looking at myself in the mirror"). Higher scores indicate greater narcissism.

Social Media Activity. Participants indicated whether they were registered users of Facebook and/or Twitter, as well as other social networking sites (Instagram, Snapchat). Those who were registered users of Twitter indicated how many minutes on average they

spent actively using Twitter on days they used it, how many followers they had and how many people they were following, and how frequently they wrote a tweet, retweeted, and observed without tweeting/retweeting (i.e., lurking). The latter three items used a 9-point response scale anchored with *Never* (1) and *More than hourly* (9), and were summed to form a variable assessing frequency of Twitter use.

Motives for Using Twitter. Items measuring informational and social motives for using Twitter were adapted from other measures (e.g., Chen, 2011; Hughes et al., 2012). We standardized the format so that each item began with "I use Twitter to…" and participants used a 7-point Likert scale to indicate their agreement with these statements (1 = *Strongly disagree*, 7 = *Strongly agree*).[3] The items tapping *closeness* (e.g., "I use Twitter to feel closer to others", "I use Twitter to get to know people better") and *communication* (e.g., "I use Twitter to keep in touch with people", "I use Twitter to keep others up-to-date on my life") were combined to form a single 12-item scale measuring *social connection*. One item measured attention-seeking ("I use Twitter to get attention"). Six items assessed the use of Twitter for information-seeking (e.g., "I use Twitter to stay informed", "I use Twitter to learn new things about the world") and six assessed the use of Twitter for career promotion (e.g., "I use Twitter to promote myself professionally/academically", "I use Twitter to maintain my professional/academic circle").

Tweet Topics. Participants indicated how frequently they tweet about four topics based on Marshall et al.'s (2015) factor analytically-derived classification of status update topics: social activities and everyday life (5 items: *my social activities, something funny that*

[3] Reflecting the aims of the larger project of which the current study was a part, additional motives that were not relevant to the present hypotheses were also measured. We conducted a principal components analysis with direct oblimin rotation on the total item pool, resulting in 8 components. The items loading on components reflecting closeness, communication, information-seeking, career-promotion, and attention were retained for analysis in the present study, whereas those reflecting the use of Twitter for sexual/antisocial uses, procrastination/entertainment, and self-expression were not analysed further. Items were retained if they loaded at least .32 on one component only (Tabachnik & Fidell, 2007). Only one item cleanly loaded on the component reflecting attention-seeking.

happened to me, *my everyday activities*, *my pets*, *sporting events*), intellectual pursuits (4 items: *my views on politics, current events, research/science, my own creative output – e.g., art, writing, research*), achievement orientation (3 items: *achieving my goals*, *my accomplishments, work or school*), and diet/exercise (2 items: *my exercise routine*, *my diet*). Responses were rated on a 5-point Likert scale (1 = *Never*, 5 = *Very often*). Participants were also asked if they protected their tweets (i.e., ensured they were not publically visible), but because this variable did not significantly predict the dependent variables nor influence the pattern of results when included in the following analyses, it was not analysed further.

Results

Data analysis plan. To be consistent with Study 2's preregistered data analysis plan (available here: https://osf.io/6q2zr), gender and age were entered as covariates in all Study 1 analyses; for analyses of Twitter motives and tweet topics, frequency of Twitter use and number of followers/following were entered as additional covariates. Logistic regression tested the likelihood of using Twitter (1) versus Facebook-only (0), multiple regression analyses tested the predictors of Twitter motives, and hierarchical regressions tested the predictors of tweet topics. Tests of multiple mediation in Studies 1 and 2 were conducted using Hayes's (2013) PROCESS script for SPSS. Indirect effects of the independent variable on the dependent variable through the mediators were assessed through examination of the 95% bias-corrected confidence intervals (CI) from 5,000 bootstrap samples. The control variables and the other 5 non-focal personality traits were included as covariates in the tests of mediation.

Predictors of Twitter use, motives, and tweet topics. Descriptive statistics, Cronbach's alpha coefficients, and Pearson's correlations are reported in Table 1, results of the regression analyses are reported in Table 2, and a summary of hypotheses that were confirmed/unconfirmed by the data are reported in Table 3. Results revealed, first, that people

who were higher in openness were more likely to use Twitter than Facebook-only, consistent with H1a. Openness was positively associated with the use of Twitter for career promotion rather than information-seeking, refuting H1b, but it did predict greater frequency of tweeting about intellectual topics, supporting H1c. The association of openness with tweeting more frequently about intellectual topics was mediated by the increased use of Twitter for career promotion (b = .078, SE = .036 [CI: .011, .153]).

There was no support for H2a or H2c – extraversion was not significantly associated with weaker information-seeking motives for using Twitter, nor with stronger social connection motives. Opposite to predictions (H2b), extraverts tweeted about intellectual topics *more* frequently, not less. This association was not significantly mediated by any of the motives for using Twitter. Supporting H2d, extraverts tweeted more frequently about social activities and everyday life, but this was not mediated by any of the motives for using Twitter.

Narcissists were not any more likely to use Twitter than Facebook-only, refuting H3a, but as predicted, narcissists were more likely to use Twitter for attention-seeking (H3b) and career promotion (H3c). Confirming H3d and H3e, narcissists also tweeted more frequently about personal achievements and diet/exercise. Narcissists' more frequent tweets about personal achievements were motivated by career promotion (b = .107, SE = .06 [CI: .015, .245]) and social connection (b = .271, SE = .119 [CI: .04, .508]), whereas their tweets about diet/exercise were motivated by attention-seeking (b = .115, SE = .068 [CI: .009, .275]) and social connection (b = .122, SE = .068 [CI: .01, .274]). Finally, narcissists tweeted more frequently about their social activities and everyday life, which was motivated by their use of Twitter for social connection (b = .292, SE = .131 [CI: .053, .557]).

As for the other Big Five traits, neuroticism was positively associated with using Twitter for career promotion, but conscientiousness and agreeableness were not significantly

associated with any of the dependent variables. To sum up, the results of Study 1 confirmed several hypotheses (see Table 3), but several of our predictions were not borne out and other findings were unexpected (i.e., extraverts tweeted more frequently about intellectual topics and narcissists tweeted more often about social activities and everyday life). Because these results may have been idiosyncratic to this particular sample of Americans, we reserved further speculation until we were able to evaluate their replicability in Study 2.

Study 2

In Study 2, a preregistered replication and extension of Study 1, we collected data from British participants, sought to confirm and refine our measure of Twitter motives, and measured all three Dark Triad traits. Furthermore, we assessed how much people like to read tweets/retweets about the various tweet topics and how many likes/retweets they receive on average to a typical tweet. We examined on an exploratory basis whether people particularly liked tweet topics that they themselves tweeted about more frequently, and whether people who tweeted/retweeted more often about well-liked topics received more likes/retweets on average compared to people who frequently tweeted/retweeted about less liked topics. We predicted that people with narcissistic and Machiavellian traits would receive more likes/retweets to their posts because they tend to carefully curate what they tweet (Preotiuc-Pietro et al., 2017) and because we thought they would be more likely to tweet about personal achievements.

We preregistered the following hypotheses on the Open Science Framework (available here: https://osf.io/6q2zr).[4] Similar to Study 1, associations of agreeableness, conscientiousness, and neuroticism with the dependent variables were assessed on an

[4] These hypotheses were preregistered after we analysed the associations of the personality traits with the likelihood of using Twitter versus Facebook-only in Study 1, but before we analysed the associations of the traits with the motives and tweet topics (we were under considerable time pressure to preregister Study 2 before the snap UK election in June 2017).

exploratory basis only, as were associations of psychopathy. The mediational analyses were also exploratory.

H1: Openness will be positively associated with the likelihood of using Twitter versus Facebook-only (H1a), with the use of Twitter for information (H1b), with the frequency of posting about intellectual topics (H1c), and with greater liking of others' posts about intellectual topics (H1d).

H2: Extraversion will be positively associated with the use of Twitter for social connection (H2a), with the frequency of posting about social activities and everyday life (H2b), and with greater liking of others' posts about social activities and everyday life (H2c).

H3: Narcissism will be positively associated with the use of Twitter for attention (H3a) and for career promotion (H3b), with the frequency of tweets about fitness/diet (H3c) and personal achievements (H3d), and with the number of likes/retweets that posts receive (H3e).

H4: Machiavellianism will be positively associated with the likelihood of using Twitter versus Facebook-only (H4a), with the use of Twitter for information (H4b) and for career promotion (H4c), with the frequency of tweeting about personal achievements (H4d) and intellectual topics (H4e), and with the number of likes/retweets that posts receive (H4f).

Participants

Data was collected from 503 participants (59% female; M_{age} = 37.32, SD_{age} = 11.97) who were currently living in the United Kingdom and who had either British (96%) or Commonwealth (4%) citizenship.[5] Participants were recruited through Prolific Academic and paid £5. Prolific Academic tends to yield data of equivalent quality to MTurk and includes a higher proportion of European participants (Chin, 2017). The inclusion criteria stipulated that participants needed to be registered users of Twitter and/or Facebook. Our preregistration plan indicated that participants needed to correctly answer ¾ of the embedded attention-check questions to be included in the final sample; all participants met this criterion.

Of the total sample, 234 were registered users of both Facebook and Twitter (47%), 248 were users of Facebook but not Twitter (49%), and 21 were users of Twitter but not Facebook (4%). Four participants who indicated that they never used their Twitter account

[5] The larger study from which this data was a part required that participants were eligible to vote in the 2017 UK General election.

were reclassified as Facebook-only. Of the 255 Twitter users (60% female; M_{age} = 36.86, SD_{age} = 11.80), 60% were currently working towards or had completed at least a Bachelor's degree, and 95% were White, 2% were South Asian, 1% Caribbean, and the remaining were of various ethnicities. They reported spending an average of 48.28 minutes (*SD* = 77.09) actively checking Twitter on days that they checked it. Of the Facebook-only users (59% female; M_{age} = 37.88, SD_{age} = 12.10), 58% were currently working towards or had completed at least a Bachelor's degree, and 93% were White, 2% were South Asian, 1% Southeast Asian, 1% Caribbean, and the remaining were of various ethnicities.

Materials and Procedure

Participants completed the following scales and two of the same measures from Study 1 (Berkeley Personality Profile and the tweet topic frequency scale) in an online survey.[6] Cronbach's alpha coefficients are reported in Table 1. This research was approved by the research ethics committee at the first author's institution.

Dark Triad. The Short Dark Triad scale (Jones & Paulhus, 2014) measures narcissism (e.g., "I know that I am special because everyone keeps telling me so"), Machiavellianism (e.g., "There are things you should hide from other people to preserve your reputation"), and psychopathy (e.g., "People who mess with me always regret it"). Each subscale is measured with 9 items rated on a 5-point Likert scale (1 = *Strongly disagree*, 5 = *Strongly agree*).

Social Media Activity. Participants were asked whether they were registered users of Facebook, Twitter, or other social media sites (Instagram, Snapchat), how many minutes a day they actively spent on Twitter, and how many Twitter followers/followees they had. Following our preregistration plan, frequency of Twitter use was measured by the mean score

[6] We also included the Rosenberg Self-Esteem Scale (1965), but because the inclusion of self-esteem in our regression models did not appreciably alter our pattern of results, it was removed.

of how often participants reported tweeting, retweeting, and lurking (1 = *Never*, 5 = *Very frequently*). However, reliability was low (a = .35), and further inspection revealed that it would increase to a = .69 if the item measuring lurking was deleted. Because our preregistration plan stipulated that items reducing Cronbach's alpha to less than .50 would be deleted, the lurking item was removed. Furthermore, participants indicated how many likes or retweets they receive on average per tweet (1 = 0-10, 2 = 10-20, 3 = 20-30, 4 = 30-40, 5 = 40-50, 6 = More than 50).

Motives for Using Twitter. Participants rated the 58 items measuring motives for using Twitter that were derived in Study 1. As per our preregistered analysis plan, the items measuring information-seeking, career promotion, social connection, and attention-seeking motives were subjected to confirmatory factor analysis. Because attention-seeking was only measured with 1 item in Study 1, we included 5 additional items to more fully tap the construct and increase reliability. Items were removed if they did not load sufficiently highly on their respective latent variable (i.e., .32 or above; Tabachnik & Fidell, 2007) or that cross-loaded too highly. The revised model provided an adequate fit with the data: $\chi^2(113) = 208.82$, $p < .001$, CFI = .96, RMSEA = .07 (CI = .05, .08), SRMR = .06. In this revised model, four items measured information-seeking (e.g., "I use Twitter to find out what is happening right now", "I use Twitter to find information"), four measured career promotion (e.g., "I use Twitter to promote myself professionally/academically," "I use Twitter to publicize my creative output, e.g., music, art, writing, research"), six measured social connection (e.g., "I use Twitter to keep in touch with people", "I use Twitter to get to know people better"), and three measured attention-seeking (e.g., "I use Twitter to show off", "I use Twitter to post sexy photos of myself").

Liking for Tweet Topics. Alongside their ratings of how frequently they tweeted or retweeted about the 14 tweet topics, participants were also asked to indicate how much they

liked reading tweets and retweets about each topic (1 = *Dislike a great deal*, 7 = *Like a great deal*). They were summed so that they corresponded with the four tweet topic frequency categories (i.e., liking for tweets about intellectual topics, personal achievements, diet/exercise, and social activities and everyday life).

Results

Data analysis plan. Following our preregistered analysis plan, we included gender and age as covariates in all regression analyses, and frequency of Twitter use and average number of followers/following as covariates in all models except the likelihood of using Twitter versus Facebook-only. The covariates, Big Five, and Dark Triad traits were entered together in the logistic regression analysis to test the predictors of using Twitter (1) versus Facebook-only (0), and in the multiple regression models testing the predictors of Twitter motives; they were also entered together in Step 1 of the hierarchical regression models testing the predictors of tweet topics and likeability of topics, and Twitter motives in Step 2.[7] [8]

Predictors of Twitter use, motives, and tweet topics. Descriptive statistics and Pearson's correlations are reported in Table 4, results of the regression analyses are reported in Tables 5 and 6, and a summary of confirmed/unconfirmed hypotheses is reported in Table 7. First, our analyses revealed support for H1a: openness significantly predicted a greater likelihood of using Twitter than Facebook-only.[9] Openness was significantly associated with the use of Twitter for career promotion rather than for information-seeking, refuting H1b, but

[7] We also ran these regression models with the Twitter motive variables configured as they were in Study 1. The pattern of results was the same as that reported in Table 5 except that Machiavellianism and psychopathy were not significantly associated with attention-seeking.

[8] The preregistered data analysis plan stated that we would test our predictions with SEM given sufficient sample size, and with multiple regression given insufficient sample size. With 255 Twitter users and numerous parameter estimates, we felt it was prudent to conduct regression analyses.

[9] We also ran two logistic regression analyses to test the control variables, Big Five, and Dark Triad variables as predictors of using Instagram and Snapchat versus Facebook-only. None of the variables predicted Instagram use, and only extraversion predicted Snapchat use ($B = .07$, $p = .036$), suggesting that the significant associations of openness and Machiavellianism with Twitter use were not driven simply by openness to using multiple social technologies. Thus, the higher openness and Machiavellianism of Twitter users appears to be unique to Twitter.

as predicted (H1c), it was positively associated with the frequency of posting about intellectual topics. The indirect effect of openness on frequency of posting about intellectual topics through career promotion was significant (*b* = .056, *SE* = .033 [CI: .002, .130]). Moreover, openness was negatively associated with the frequency of posting about diet/exercise; none of the indirect effects through the Twitter motives were significant.

There was no support for H2a or H2b: extraversion was not significantly associated with the use of Twitter for social connection, nor with the frequency of posting about social activities and everyday life. Instead, extraversion was negatively associated with the use of Twitter for attention-seeking.

Hypotheses for narcissism were confirmed: it was positively associated with the use of Twitter for attention-seeking (H3a) and career promotion (H3b), and with the frequency of tweeting about diet/exercise (H3c) and personal achievements (H3d). Unexpectedly, narcissism was also positively associated with social motives for using Twitter. Several indirect effects were significant: narcissists' use of Twitter for career promotion (*b* = .169, *SE* = .056 [CI: .072, .287]), social connection (*b* = .088, *SE* = .035 [CI: .021, .158]), and attention-seeking (*b* = .158, *SE* = .054 [CI: .068, .279]) explained their higher frequency of tweeting about personal achievements; and their use of Twitter for attention-seeking (*b* = .213, *SE* = .077 [CI: .08, .38]) and social connection (*b* = .071, *SE* = .032 [CI: .017, .140]) explained their higher frequency of tweeting about diet/exercise.

Machiavellianism was positively associated with the likelihood of using Twitter versus Facebook-only, confirming H4a, but it was not significantly associated with information-seeking (H4b) or career promotion (H4c), nor with the frequency of tweeting about personal achievements (H4d), and it was negatively rather than positively associated with the frequency of tweeting about intellectual topics (H4e). Machiavellians' lower motivation to use Twitter for attention-seeking explained their lower frequency of tweeting

about intellectual topics (b = -.053, SE = .026 [CI: -.115, -.014]) and about diet/exercise (b = -.087, SE = .037 [CI: -.166, -.024]).

Two other significant findings emerged from our exploratory analyses: agreeableness was positively associated with social connection motives, and psychopathy was positively associated with attention-seeking motives.

Predictors of tweet likeability and number of tweets/retweets received. Descriptive statistics, Cronbach's alpha coefficients, Pearson's correlations, and regression results are reported in Table 6. A repeated-measures ANOVA on the likeability ratings was significant, $F(3, 251) = 37.80$, $p < .001$, $\eta_p^2 = .31$. Tweets about intellectual topics were rated the most likeable and tweets about diet/exercise the least likeable, with tweets about social activities/everyday life and personal achievements in between. Pairwise comparisons with Bonferroni corrections were significant ($p < .001$), except the comparison between the ratings for intellectual topics and social activities/everyday life ($p = .089$).

To test the predictors of likeability of the four tweet topics, the control variables and personality traits were entered in Step 1 of hierarchical regression models and the motives for using Twitter were entered in Step 2. Supporting H1d, openness was positively associated with liking to read tweets/retweets about intellectual topics; information-seeking and social connection motives were also positively associated. There was only weak support for H2c: extraversion was positively correlated with greater liking of tweets about social activities and everyday life, but this association was not significant in the regression analysis. Rather, liking of these posts was negatively associated with career promotion, and positively associated with social connection. Several other significant findings emerged from the exploratory analyses: narcissism and social connection motives were positively associated with liking to read posts about personal achievements; and openness and career promotion motives were

negatively associated with liking tweets/retweets about diet/exercise, whereas narcissism, social connection, and attention-seeking motives were positively associated.

Finally, we tested the same variables as predictors of the number of likes/retweets received on average to a typical tweet in a hierarchical regression model (Table 6). H3e was supported: narcissism was positively associated with the number of likes/retweets received to a typical tweet. Contrary to H4f, people higher in Machiavellianism reported receiving a significantly *lower*, not higher, number of likes/retweets. In the second step of the model, social connection was negatively associated and attention-seeking and frequency of tweeting about diet/exercise were positively associated with the number of likes/retweets. None of the indirect effects through tweet topics were significant, so we removed them from the model and only tested the indirect effects through the motives for using Twitter. Narcissism (b = .163, SE = .09 [CI: .014, .364]) and Machiavellianism (b = -.066, SE = .039 [CI: -.152, -.006]) were both indirectly associated with number of likes/retweets received through attention-seeking motives.

General Discussion

This research is the first to examine the Big Five and Dark Triad traits as simultaneous predictors of the likelihood of using Twitter versus Facebook-only, motives for using Twitter, frequency of tweeting about and likeability of various topics, and the number of likes/retweets typically received. Our results confirmed that there does indeed appear to be something unique about people who use Twitter rather than just Facebook: they are higher in openness and Machiavellianism. We review these findings in more detail next, and discuss the implications for enhancing users' experience of Twitter and the extent to which social scientists may generalize from Twitter data to larger populations.

Openness. We found, in both studies, that openness was positively associated with the likelihood of being a Twitter user, with using Twitter for career promotion and, in turn,

with tweeting more frequently about intellectual topics. Highly open individuals, who are often entrepreneurial (Leutner, Ahmetoglu, Akhtar, Chamorro-Premuzic, 2014) and pursuing scientific or artistic careers (Feist, 1998), may be particularly attracted to Twitter because it allows them to share their creative output, keep up-to-date on the latest work in their field, and network with colleagues. Indeed, almost half of scientists use social media to exchange research findings (Pew Research Centre, 2015b). Surprisingly, we did not find that highly open individuals were more strongly motivated to use Twitter for information-seeking, as they tend to be in their use of Facebook (Marshall et al., 2015). Further research, with larger and more diverse samples, will need to confirm that highly open individuals are indeed attracted to Twitter specifically for the career opportunities it affords rather than for its more general use as a tool for seeking and sharing information.

Extraversion. Extraverts tweeted more often about their social activities and everyday life in Study 1, but this finding was not replicated in Study 2. Moreover, extraverts were not more strongly motivated to use Twitter for social connection in either study, suggesting that, in spite of some of the social affordances Twitter provides (Chen, 2011), extraverts may still prefer to use other social media sites like Facebook for socializing (Hughes et al., 2012).

Narcissism. In both studies, narcissism was more strongly associated with the various motives for using Twitter and with tweeting about more topics than any other personality trait. Nonetheless, narcissists were not any more likely to use Twitter than Facebook-only, suggesting that Twitter's affordances – particularly the potential to gain admiration from weak-tie contacts – may not be sufficiently alluring to narcissists. Still, the present studies confirmed several hypotheses. First, narcissists' greater frequency of tweeting about personal achievements was motivated by their use of Twitter for career promotion (Studies 1 and 2) and attention-seeking (Study 2). Unexpectedly, it was also motivated by their use of Twitter

for social connection (Studies 1 and 2), suggesting that narcissists may brag about their accomplishments not only for self-promotion, but also to communicate with and feel closer to others. Perhaps they view these tweets simply as a way of sharing good news – a capitalization attempt that may enhance friendship quality (Demir, Dogan, & Procsal, 2013). Narcissists' greater use of Twitter for social connection also motivated their more frequent tweets about their social activities and everyday life (Study 1), consistent with findings that narcissists' tweets are more likely to refer to friends (Sumner et al., 2012) and everyday life (Preotiuc-Pietro et al., 2017).

Nevertheless, narcissists' tweets about social activities were also motivated by their use of Twitter for attention-seeking, suggesting that their motives for posting such tweets may not be entirely prosocial; they may also be seeking social status and admiration. Indeed, narcissists may use social media for building social capital and for social grooming, especially if it enables them to take advantage of others (Garcia & Sikstorm, 2014). And if social capital and reward is embodied by the number of likes and retweets one's tweets typically receives, then narcissists' self-promoting strategy pays off. Their desire for attention not only explained why they reported receiving more likes and retweets, but also explained why they were more likely to tweet about diet and exercise in both studies. In line with narcissists' vanity about their appearance (Vazire et al., 2008) and desire for admiration from Twitter followers (Davenport et al., 2014), they may tweet about their diet and exercise routine because they want attention for being physically fit.

Machiavellianism. As predicted, people with Machiavellian traits were more likely to use Twitter than Facebook-only (Study 2), but the data provided few clues to explain Twitter's appeal for these individuals. Contrary to hypotheses, Machiavellians were not significantly more likely to use Twitter for information-seeking or career promotion, nor did they tweet more frequently about intellectual topics or personal achievements in a purported

attempt to impress influential others. If anything, they were *less* likely to use Twitter for attention-seeking, which explained why they tweeted less frequently about intellectual topics and diet/exercise. Because Machiavellians are concerned with reputational management (Jones & Paulhus, 2014), they may avoid tweeting about topics that have the potential to make them look pretentious or boastful. But this cautious strategy may come at a cost: their aversion to attention-seeking explained why they received fewer likes/retweets on average to their tweets, suggesting that their low-key presence on Twitter does not generate much social reward. While this data tells us what does *not* motivate Machiavellians and what they do *not* tweet about, it does not tell us what *does* motivate them and what they *do* tweet about. One possibility is that Machiavellians are more likely to use Twitter to keep a cunning eye on friends and enemies alike. Such surveillance may allow them to gather information that is later used for manipulation and to gain social status.

Likeability of Tweet Topics

Study 2 revealed that Twitter users most liked to read tweets/retweets about intellectual topics and least liked to read tweets about diet and exercise, consistent with other findings that information-sharing tweets are liked the most and personal tweets the least (Andre et al., 2012). This is not surprising given that Twitter users, on average, were higher in openness than non-users in Studies 1 and 2, and these were the tweet topics that highly open people liked most and least. These results suggest that highly open people, by gravitating towards Twitter for the intellectual stimulation and career opportunities that it affords, may be influential in setting trends and what is considered popular and entertaining on Twitter. This may be particularly true for "public intellectuals", actors, musicians, writers, artists, or other celebrities who tend to amass large numbers of followers and likes/retweets.

If indeed Twitter is the kingdom of the intellectual and creative, then the current results also suggested that it may not be for the diet- and fitness-oriented. Study 2 participants

tweeted least frequently about diet/exercise and liked these tweets the least, suggesting that posts about diet and exercise may be received more favourably in a social networking site like Instagram, where the sharing of photos may be more appealing to people concerned with fitness, health, and physical appearance. Paradoxically, however, Study 2 also found that people who frequently tweeted about diet/exercise reported receiving a significantly *greater* number of likes/retweets. Shouldn't people who post about unpopular topics on Twitter receive fewer, not more, likes and retweets? While most Twitter users may favour and tweet about intellectual topics, there may be a cadre of individuals from a health and fitness-oriented community who use Twitter to connect with each other and encourage each other's health-related goals by supplying likes and retweets to each other's posts. Indeed, tweeting about diet/exercise was not only predicted by attention-seeking motives, but also by social connection motives. What may matter most, then, is not what topics are deemed most likeable by Twitter users in general, but the topics deemed most likeable within one's own social network. Indeed, the various niches within Twitter – for example, those dominated by certain politicians or celebrities – may produce tweets that are only deemed likeable by the people within that niche.

Limitations and Future Directions

While this research had several strengths – notably, that we conducted a preregistered replication of our findings in a different country – it also had several limitations. First, participants self-reported the frequency with which they tweeted about various topics and the number of likes/retweets they received, which may be prone to memory or social desirability biases. In particular, Machiavellians' concern with reputation management may mean that they downplayed how frequently they tweeted about less socially desirable topics (e.g., diet/exercise), whereas narcissists – who enjoy showing off – may be especially likely to inflate the number of likes/retweets they receive. Future research should code participants'

actual tweets for various topic themes and record the number of likes/retweets for each, then examine associations with personality traits and motives for using Twitter. Further research could also examine whether people who tweet about topics popular within their own social network do indeed receive more likes/retweets, and whether this form of social reward enhances feelings of inclusion and well-being (Tobin et all, 2015). It may be the case that likes/retweets only enhance well-being among Twitter users who crave attention (i.e., narcissists, psychopaths, and introverts).

Second, our measures may require further refinement and expansion. In particular, our measure of informational motives for using Twitter reflected passive consumption of Twitter content rather than active generation. If future versions of this measure included items that reflected more active information exchange on Twitter, such as posting links to news stories, we might find that it is associated with personality traits such as openness. Indeed, we found that openness was significantly associated with career promotion, which tapped more active content generation (e.g., using Twitter to publicize one's own creative output). Furthermore, it would be useful to measure a wider range of tweet topics. That people with psychopathic and Machiavellian traits are more likely to swear, use negative emotion words, and express anger in their tweets (Preotiuc-Pietro et al., 2017; Sumner et al. 2012) suggests that future research could test the predictors of tweeting about and liking for "darker" topics.

Finally, while we sampled Twitter users from two different countries, they may not be representative of the overall population of Twitter users, just as Twitter users may not be representative of larger populations. Even though we found that Twitter users were higher in openness than Facebook-only users in both samples, the effect sizes were small (*r*s = .10 and .09 in Studies 1 and 2, respectively) and require further replication in larger and more diverse samples.

Concluding Remarks

Twitter use has increased exponentially over the last decade, popularized by activists, celebrities, politicians, and everyday people. By suggesting that Twitter users have unique personality traits that they express through their tweets and the types of tweets they favour, the current findings have practical implications for individual users, the social networking industry, and researchers who rely on Twitter as a source of big data. First, because personality traits and motives are reflected in what one tweets about and likes in others' tweets, it may be prudent for individuals to be mindful of the messages they may be sending to particular social networks. It seems likely, for example, that highly open people who tweet about science or the arts will receive favourable evaluations of such tweets and more retweets and likes from followers who are also high in openness; tweets about fitness, on the other hand, may be evaluated unfavourably by such a crowd and neither retweeted nor liked. Tailoring the content of one's tweets to specific networks may help one to retain followers and avoid the psychological pitfalls of online rejection (Tobin et al., 2015).

Second, despite being one the world's most popular social networking sites, Twitter has a tendency to lose users (Coursaris et al., 2010) and has endured more financial challenges than has Facebook (International Business Times, 2016). Greater knowledge of who uses Twitter, why they use it, and what tweet topics they prefer may allow Twitter to refine their marketing strategy, to develop more effective techniques for retaining current users, and to pose a more credible challenge to Facebook's market domination and profitability. For example, the current results suggest that Twitter would do well to court further users in creative professions, such as science or the arts, which tend to attract people higher in openness (Feist, 1998).

Third, the current findings help to delineate the boundary conditions when extrapolating from a sample of Twitter users to the larger population. While the mining of "big data" from Twitter has surged in popularity among social scientists (Jensen, 2017), the

current findings suggest that Twitter users are not representative of an average citizen, but are particularly high in openness and Machiavellianism. Unless big data scientists take caution, then, they might erroneously conclude that the general population is more intellectual and crafty than it actually is.

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